

Appl. No. : 10/829,638
Filed : April 22, 2004

REMARKS

The January 4, 2006 Office Action was based on pending Claims 1–38, which remain as originally filed or as previously presented. In view of the attached Terminal Disclaimer and the remarks set forth below, Applicant respectfully requests reconsideration of the Claims 1–38 and submits that Claims 1–38 are in condition for allowance.

SUMMARY OF REJECTIONS

The January 4, 2006 Office Action provisionally rejected Claims 1–38 under the non-statutory obviousness-type double patenting doctrine as being unpatentable over Claims 1–60 of copending U.S. Patent Application No. 10/847,222 (“the ‘222 application”).

The Office Action rejected Claims 1, 4, 5 and 9 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,273,108 to Bergman et al. (“Bergman”).

The Office Action also rejected Claims 2 and 3 under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of U.S. Patent No. 5,593,505 to Erk et al. (“Erk”). Claims 6, 10–14, 17, 18, 22–27 and 29–36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of U.S. Patent No. 6,124,158 to Dautartas et al. (“Dautartas”).

Claims 16, 19, 28 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of Erk and in further view of Dautartas. Claims 16, 19, 28 and 37 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of Erk and in further view of Dautartas, and in further view of U.S. Patent No. 5,902,407 to de Boer et al. (“de Boer”).

Claims 7 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of U.S. Patent No. 5,695,092 to Schrandt (“Schrandt”). Claims 20 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of Dautartas and in further view of Schrandt.

CLAIM REJECTIONS FOR OBVIOUSNESS-TYPE DOUBLE PATENTING

The Office Action provisionally rejected Claims 1–38 under the non-statutory obviousness-type double patenting doctrine as being unpatentable over Claims 1–60 of the '222 application. In response, Applicant submits herewith a Terminal Disclaimer in compliance with 37 C.F.R. §1.321(c) and respectfully requests that the obviousness-type double patenting rejections be withdrawn.

CLAIMS 15 AND 38

The January 4, 2006 Office Action rejected Claims 15 and 38 only under the non-statutory obviousness-type double patenting doctrine and not in view of other cited art. However, in view of the comments on page 7 of the Office Action, Applicant will assume for the purposes of this Response that Claim 15 was intended to also be rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view Dautartas and Erk, and that Claim 38 was intended to also be rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view Erk in further view of Dautartas, and in further view of de Boer.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

The Office Action rejected Claims 1, 4, 5 and 9 as being anticipated by U.S. Patent No. 6,273,108 to Bergman. For at least the reasons set forth below, Applicant respectfully disagrees and requests reconsideration of the aforementioned claims.

Independent Claim 1

Focusing on independent Claim 1, in one embodiment of Applicant's invention an apparatus is disclosed comprising at least one wafer-processing chamber having an ozone-rich environment. The claimed apparatus further includes a rotator, a sprayer and a pulsating fluid source. The rotator creates a gap between a wafer and a wafer cassette and is configured to rotate the wafer. The pulsating fluid source is configured to pulse a solution through the sprayer into the ozone-rich environment while the wafer is rotating.

Bergman does not disclose the apparatus of independent Claim 1. For instance, Bergman does not disclose "a rotator that creates a gap between a wafer and a wafer cassette," as recited by Claim 1. Rather, as shown and described with reference to Figures 1 and 2 of Bergman, semiconductor workpieces 20 (wafers) are supported directly by one or more supports 25. These supports 25, which also appear to be characterized as a wafer cassette in column 5, lines 47–53, are coupled to a rotor assembly and are configured to rotate the workpieces 20. Although the Office Action generally asserts that Figures 1 and 2 of Bergman illustrate a gap between a cassette and a wafer, Applicant was unable to see such a structure in the identified figures. Rather, it would appear from the disclosure of Bergman that the supports 25 would need to have direct contact with the wafers in order to provide for rotation of the wafers.

Furthermore, Bergman does not disclose a "pulsating fluid source . . . configured to pulse a solution through the sprayer into the ozone-rich environment while the wafer is rotating," as recited by Claim 1. Although the Office Action characterizes the pumping mechanism 55 of Bergman as a pulsating fluid source, Bergman appears to disclose otherwise. In particular, Bergman discloses at column 4, lines 36–38 that the pump mechanism 55 "provides liquid under pressure along a fluid flow path." Bergman further discloses the flow rate of the liquid as being a continuous spray. See column 6, lines 17–36. Bergman does not disclose the pumping mechanism 55 as being configured to pulse a solution through a sprayer.

Because Bergman does not disclose each limitation recited in Claim 1, Applicant asserts that Claim 1 is not anticipated by Bergman, and Applicant respectfully requests allowance of Claim 1.

Dependent Claims 4, 5 and 9

Claims 4, 5 and 9 depend from independent Claim 1 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1 and for the additional features recited therein.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

The Office Action rejected Claims 2 and 3 as being unpatentable over Bergman in view of Erk. Claims 6, 10–14, 17, 18, 22–27 and 29–36 were rejected as being unpatentable over Bergman in view of Dautartas. Claims 15, 16, 19, 28 and 37 were rejected as being unpatentable over Bergman in view of Erk and in further view of Dautartas.

The Office Action also rejected Claims 16, 19, 28, 37 and 38 as being unpatentable over Bergman in view of Erk and in further view of Dautartas, and in further view of de Boer. Claims 7 and 8 were rejected as being unpatentable over Bergman in view of Schrandt. Claims 20 and 21 were rejected as being unpatentable over Bergman in view of Dautartas and in further view of Schrandt.

For at least the reasons set forth below, Applicant respectfully disagrees with these rejections and the characterization of the cited art, and Applicant respectfully requests reconsideration of the aforementioned claims.

Independent Claim 10

Focusing on independent Claim 10, in one embodiment of Applicant's invention an apparatus is disclosed for processing a wafer. The apparatus includes a semiconductor processing chamber, a rotator and a pulsating fluid source. The rotator is configured to rotate at least one wafer within the semiconductor processing chamber. The pulsating fluid source is configured to pulse an ozone-rich solution into the semiconductor processing chamber more than once while the wafer is rotating within the semiconductor processing chamber.

As discussed in more detail below, the cited art does not render obvious the invention recited in Claim 10.

Bergman

Bergman is directed to an apparatus and method for cleaning the surface of a semiconductor workpiece. The Office Action appears to indicate that Bergman teaches a wafer processing chamber and a rotator. In particular, Bergman discloses applying a continuous spray of deionized water to maintain the workpiece at an elevated

temperature and rotating the workpiece at high speeds during cleaning. See column 6, lines 26–36. The Office Action also acknowledges that Bergman does not teach a pulsating fluid source as recited in Claim 10.

Dautartas

Dautartas is directed to a hot-wall reaction chamber process for atomic layer deposition of a thin film of gate dielectric. The Office Action cites Dautartas for teaching “a semiconductor apparatus wherein pulsed valves selectively pulse fluid through a sprayer.”

Combination of Bergman and Dautartas

The Office Action states that “it would have been obvious at the time of the claimed invention to modify the apparatus of Bergman . . . in view of the pulsed valves of Dautartas.” The Office Action further states that the “motivation to include the pulsed valves of Dautartas [with the apparatus of Bergman] is that they provide enhanced flow control, increased efficiency and reliability.”

Applicant respectfully submits that such a combination is improper because there is no suggestion or motivation to combine these references to teach the claimed invention. The fact that references can be combined is not sufficient to establish obviousness. See M.P.E.P. § 2143.01(III). Rather, M.P.E.P. § 2143.01 requires that the motivation to combine references must come from: (1) the nature of the problem to be solved, (2) the teachings of the prior art and/or (3) the knowledge of persons of ordinary skill in the art. The Office Action’s stated motivation to combine based on “enhanced flow control, increased efficiency and reliability” does not appear to relate to any of the acceptable sources for a motivation to combine. For instance, the stated motivation appears to have no relation to the nature of the problems addressed and solved by the claimed invention, as detailed in Applicant’s specification.

In addition, Applicant submits that the nature of each of Bergman and Dautartas teaches away from such a combination and from the wafer-processing apparatus of independent Claim 10, which includes a pulsating fluid source configured to pulse an ozone-rich solution into a semiconductor processing chamber while a wafer is rotating.

For instance, Dautartas concerns a hot wall reactor usable to form semiconductor thin film structures on a wafer through atomic layer epitaxy. Dautartas discloses using a pulse of ozone gas to react with, or oxidize with, carbon contaminants in the film. Bergman, on the other hand, teaches using a continuous spray of a liquid to maintain a semiconductor workpiece at an elevated temperature during cleaning (see, e.g., column 6, lines 24–35). Such a disclosure by Bergman teaches away from using Dautartas' gas pulse source with the workpiece-cleaning apparatus of Bergman.

Furthermore, even if Bergman and Dautartas are combined, they do not teach or suggest every limitation of Claim 10. For instance, the references do not teach or suggest a wafer-processing apparatus having a pulsating fluid source that pulses an ozone-rich solution into a semiconductor processing chamber during rotation of the wafer. That is, an apparatus for simultaneous pulsing of a solution and rotating of a wafer is not suggested or taught by the cited references.

Summary

Because Bergman and Dautartas are not properly combinable and, even if combined, do not teach or suggest an apparatus having a pulsating fluid source that pulses an ozone-rich solution into a semiconductor processing chamber during rotation of the wafer, Applicant asserts that Claim 10 is patentably distinguished over the cited references, and Applicant respectfully requests allowance of Claim 10.

Independent Claims 17, 23 and 31

Independent Claims 17, 23 and 31 are believed to be patentably distinguished over the cited art for reasons similar to those set forth with respect to the patentability of independent Claim 10 and for the different aspects recited therein.

Dependent Claims 2 and 3

Claims 2 and 3 depend from independent Claim 1 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1 and for the additional features recited therein. For example, neither Bergman nor Erk appears to teach or suggest a pulsating fluid source configured to pulse a solution through a sprayer.

Dependent Claim 6

Claim 6 depends from independent Claim 1 and is believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1, for reasons similar to those set forth with respect to independent Claim 10, and/or for the additional features recited therein.

Dependent Claims 7 and 8

Claims 7 and 8 depend from independent Claim 1 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1 and for the additional features recited therein. For example, Applicant was unable to find in Bergman or Schrandt the teaching of a pulsating fluid source configured to pulse a solution through a sprayer.

Dependent Claims 11–16

Claims 11–16 depend from independent Claim 10 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 10 and for the additional features recited therein.

For instance, with respect to the Claim 15, Applicant submits that the combination of Bergman, Dautartas and Erk are improper because the references teach away from such a combination. In addition to the arguments already presented with respect to Claim 10, Erk further teaches away from this three-way combination because the rotator of Erk is structured to operate at low speeds (i.e., 8–18 rpm) while the apparatus of Bergman depends on high rotational speeds of the wafer (e.g., 300–1500 rpm). See column 6, lines 26–36.

Dependent Claims 18–22

Claims 18–22 depend from independent Claim 17 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 17 and for the additional features recited therein.

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Dependent Claims 24-30

Claims 24-30 depend from independent Claim 23 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 23 and for the additional features recited therein.

Dependent Claims 32-38

Claims 32-38 depend from independent Claim 31 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 31 and for the additional features recited therein.

REQUEST FOR TELEPHONE INTERVIEW

Pursuant to M.P.E.P. § 713.01, in order to expedite prosecution of this application, Applicant's undersigned attorney of record hereby formally requests a telephone interview with the Examiner as soon as the Examiner has considered the effect of the arguments presented above. Applicant's attorney can be reached at (949) 721-2998 or at the general office number listed below.

CONCLUSION

In view of the foregoing, the present application is believed to be in condition for allowance. If further issues remain to be resolved the Examiner is cordially invited to contact the undersigned such that any remaining issues may be promptly resolved.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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